

AUTOMATIC SYSTEMS OF CAST MANIPULATION FOR THE MACHINES AND INJECTION AGGREGATES BUILT-UP FOR THE FOOTWEAR INDUSTRY

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Abstract. The paper presents a series of flexible possibilities of assembling, disassembling, manipulation, cast actions used for sole manufacturing for footwear through industrial robots.

1. INTRODUCTION

In the manufacturing process of footwear there are used a series of prefabricated obtained of polymeric mixtures through injection processes.

The park of boot-last for injection casts required for the execution in rhythmic conditions in an amount production of soles, heels, footwear is conditioned by a complex criteria such as: the daily amount of products made of a certain type; the structure on size numbers of manufacture in certain size series, respectively the technological time during the time that the injection cast is engaged in the manufacturing process of injection products, correlated with the machine's efficiency, the necessity of the limits assurance for operative and maintenance conditions.

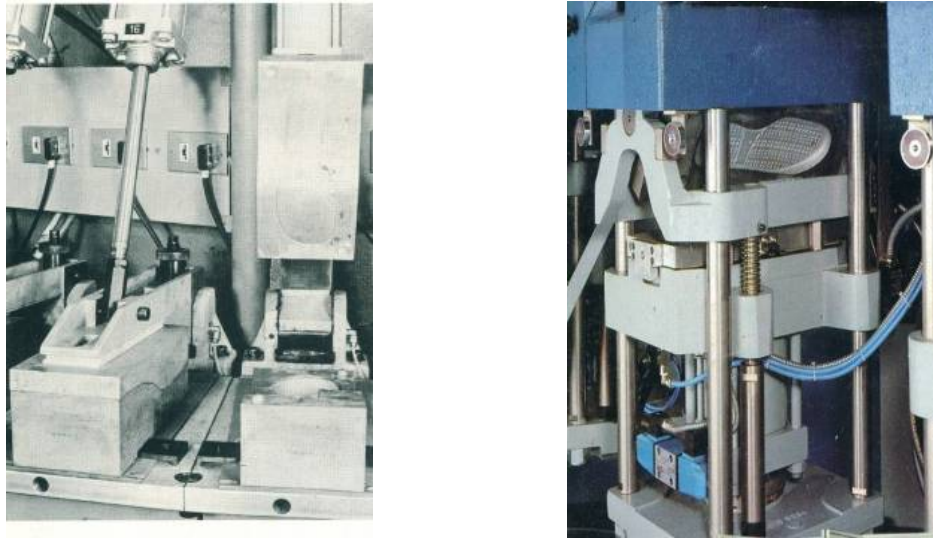
Therefore it is necessary to use flexible technological systems, with a high level of automation for the technological equipment so that the dependence of the human operator is minimum.

In the paper there are presented a series of automatic systems on assembling, disassembling, casts action that are used in the injection aggregates in footwear industry.

2. AUTOMATIC MANIPULATION SYSTEMS OF CASTS FOR THE MACHINES AND THE INJECTION AGGREGATES

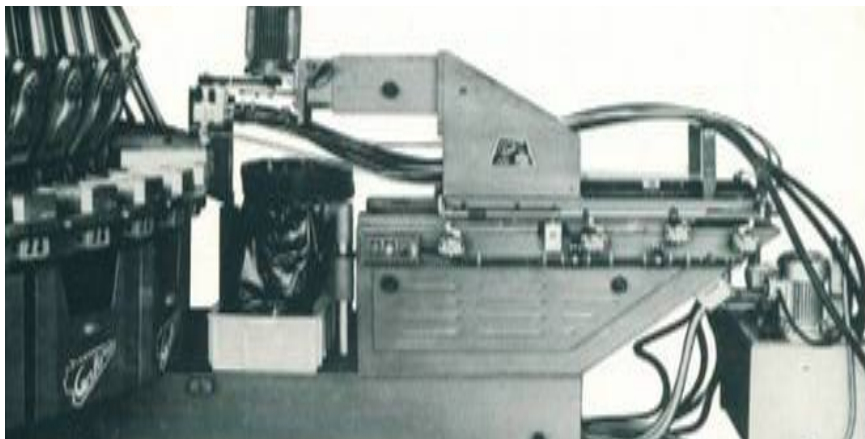
In case of injection for technical systems of some prefabricated for footwear and entire footwear it is necessary the assurance and technical endowment of the equipment and injection aggregates with modern systems of assembling, disassembling, closing, opening. This systems offers the following possibilities: the existence of technical equipment for transfer and powered manipulation; the presence of robots manipulator's installation in a computerized operating system; the use of a robot as a way of transfer casts from the warehouse to the machines and working units; warehouse packs for storage injection casts ; the assurance with automatic technical method for blocking, unblocking insertion casts in working position for using with maximum efficiency of robots and manipulators with a palletizing program [1,2,3,4].

In pictures nr. 1, 2, 3, 4 there can be seen some manipulating systems, the automatic action of casts for the machines and the injection aggregates.



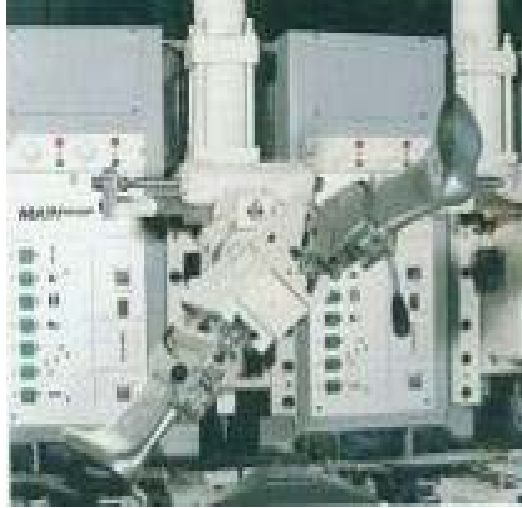
Picture 1. Robots, manipulation, action, casts

The robots and manipulators introduction in the assembling processes of casts on working position, for the machines and the injection aggregates, was determined by a large number of assembling operations, almost 20-30%, in the case of total manufacture of the injected products.



Picture 2. Transfer robots, casts' manipulation

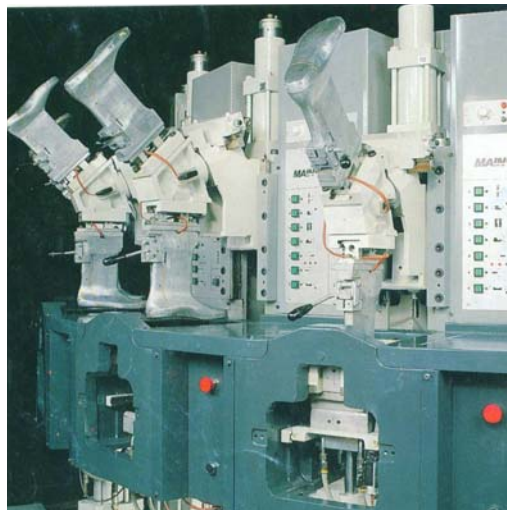
For the footwear industry and especially in the professional system with injected footwear, manipulators and robots are used for the operations of injection, cooling, evacuation and transfer of the injected pieces from the working space of injection machine for storage them in the container on some bands conveyer.



Picture 3. Flexible sistem for casts' action in computerised sistem

For this kind of operations there are used universal robots type LPI-1 made in Russia, OPTO-Sense built by Auto-Place from USA, Univision and Puma made by Unimate from USA or the special robots for executing the mentioned operations, like Myo-Matic made in Denmark, Mouldmation Micro-2 made in England, Robomat in France.

Considering the construction of the robots and manipulators, a great importance has the gripping device generally known from the English language as "gripping".



Picture 4. Flexible sistem for casts

These kinds of devices are conceived in relation with the functions and the specific expectations of the automatic construction that is made for.

The main function is the cast's positioning and attachment directed by the manipulator or the robot, so that is possible the casts' assembling and disassembling during the injection process of the products.

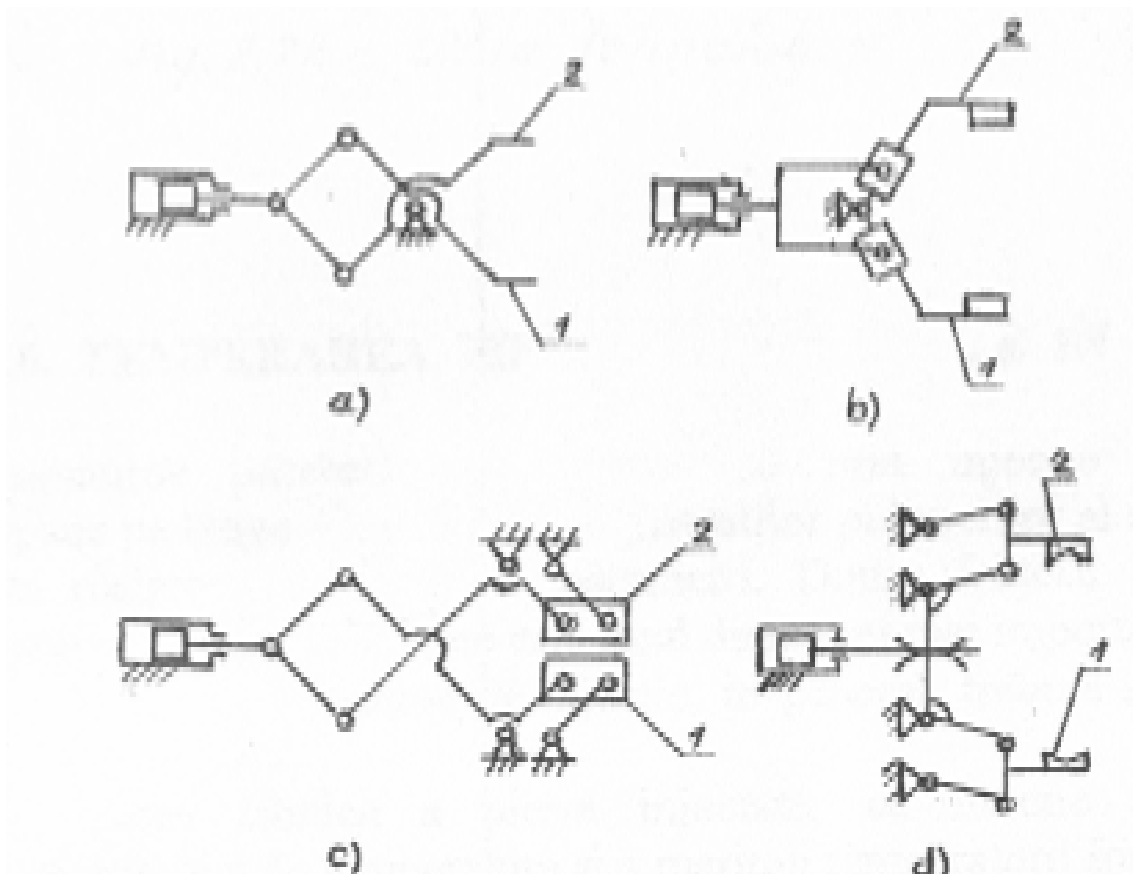
The shape, dimensions and weight of the working tools (injection casts, injected products), so as the mechanical properties are inducing the construction of the gripping devices.

The gripping ensemble of the devices contains the gripping fingers, the force and position transducer in the insertion position and a signalize of the gripped piece presence. The action chains made of superior gear which has the classic configuration of type 3RT or 2R2T mechanisms.

In the 5rd figure there are presented the gripping kinematic charts where the 1st and 2nd fingers have rotational and translational motions.

The attaching function it is usually provided by the mechanical effect caused by the clamping and fractioning forces through the so named "mechanical hands" that are known on a large area, because of the advantages that they present: assurance, good alignment, the manipulation possibility of a great charge.

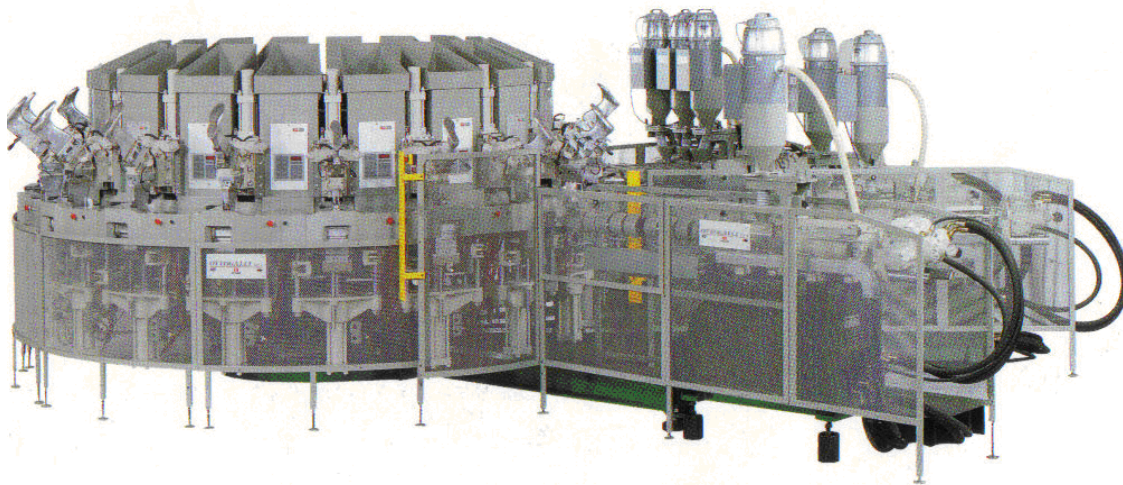
An actual example of the industrial robots and manipulators implementation in the technological lines of the injected footwear manufacture is characterized by the flexible injection lines type carousel, picture 6 end 7 where the special manipulator can serve for the automatic assembling in the cast's melting position and for the injected products ejection.



Picture 5. The gripping kinematic charts with fingers in rotational and translational motion



Picture 6. The flexible injection lines type carousel



Picture 7. Injection lines type carousel

3. CONCLUSIONS

The machines and injection aggregates performances used in footwear industry, worldwide, have registered important progress:

1. Making high reliability for the equipment
2. Low costs and energy consume
3. The increasing level of automation (measuring, checking, adjustment) using transducers and microprocessors.
4. Automation/robotize insertion/ integration especially for the assembling-disassembling operations of the casts on the equipment, for the closing-opening-

checking process of the casts at every functioning cycle, for the injected pieces ejection.

5. The use of the optimized solutions for the injected products.
6. The use of the industrial design and useful research for the product in their technical creation activity.

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REFERENCES

- [1] Ionescu Luca, C., Dragomir, A., *Leading and organizing systems of the injection process the control computer the footwear industry*, (2006) Buletinul Intitutului Politehnic Iași, Tomul LII (LVI), Fasc.5 A, Secția Construcții de mașini p.381-384, ISSN:1011-2855
- [2] Ionescu Luca, C., Dragomir, A., *Constructive types of machines and injection aggregates from the footwear Industry*, (2006) Buletinul Intitutului Politehnic Iasi, Tomul LII (LVI), Fasc.5 A, Secția Construcții de mașini, p. 385-388, ISSN:1011-2855
- [3] Ionescu Luca, C., Dragomir, A., *Tehnological injection lines from the footwear industry that use control omputers*, (2006)Buletinul Intitutului Politehnic din Iasi, Tomul LII (LVI), Fasc.5 A Secția Construcții de mașini, p.389-392, ISSN:1011-2855
- [4] Ionescu Luca, C., Ionescu, D.,S., *New technologies for obtaining through injection the precasts for footwear*, (2007), The International Scientific Symposium, "Modern technologies and performant management in the Textiles-Leathereork field", vol. VIII, Annals of the University of Oradea, p.77, ISSN 1582-5590